Available online at www.sciencedirect.com

ScienceDirect

Procedia Economics and Finance 35 (2016) 411 – 417

Procedia Economics and Finance

www.elsevier.com/locate/procedia

7th International Economics & Business Management Conference, 5th & 6th October 2015

Entrepreneurial Engagements of Academics in Engineering Universities of Pakistan

Manzoor Ali Mirani[a]*, Mohar Yusof[b]

[a]*Graduate School of Business, Universiti Tun Abdul Razak,Kuala lumpur 50480, Malaysia*
[b]*Bank Rakyat School of Business & Entrepreneurship, Universiti Tun Abdul Razak, Kuala Lumpur 50480, Malaysia*

Abstract

This paper gives an account of entrepreneurial engagements of academics in engineering universities of Pakistan. The study adds to literature on academic entrepreneurship in developing economies perspective. Data was collected through self-administered questionnaire from six engineering universities of Pakistan and 306 academics participated in the survey. Findings reveal that academics are involved in all the categories of academic entrepreneurship. However, it is quite evident that academics prefer the soft side of entrepreneurship than hard side. External teaching, seminars and consultancy are the preferred strategies compared to formation of companies within universities or without universities. The paper presents policy recommendations and future research opportunities in developing economies.

Peer-reviewed under responsibility of Universiti Tenaga Nasional

Keywords: Academic entrepreneurship, Entrepreneurial university, Developing economy, Socio-economic development, University technology transfer

1. Introduction

Entrepreneurial universities play the leading role in university technology transfer, creating entrepreneurial thinking, developing actions, institutions and entrepreneurial capital in an entrepreneurial society (Audretsch, 2014). This technology transfer from these universities takes different forms and mechanisms to attain economic development of the region. The commercialization of scientific knowledge includes the transformation of this

* Corresponding author. Tel.: +60133119746; fax: +60327307070.
E-mail address: manzoor@iba-suk.edu.pk

Peer-reviewed under responsibility of Universiti Tenaga Nasional
doi:10.1016/S2212-5671(16)00051-4

knowledge into products and processes which ultimately contribute to economic growth of economy (Ray, 2013). Within these universities, the academic scientists have assumed new role of finding the commercial use of the knowledge for industrial and financial gains (Etzkowitz, 2013). Now the actions of faculty and the universities focus on broader range of missions that exceed beyond the mere functions of teaching and research. The university is responsible for the economic development of its region and the national economy as well. To attain all these goals a university needs to focus on its region, the problems and focus its research efforts on these problems. The outcome is the entrepreneurial opportunities which could be attained with cooperation of local industry.

Entrepreneurial universities enhance the socio-economic development through academic entrepreneurship activities by the faculty and staff (Markuerkiaga, Errasti, & Igartua, 2014). The universities cooperate with the industry and engage the faculty and researchers to develop the industrially relevant products and processes. These products will enhance the development capacity of regions. The universities in developing economies are required to play their role more rigorously to create and exploit the entrepreneurial opportunities to play their part in socio-economic development.

2. Literature Review

The involvement of academics with the industry in forms of consulting, scientific instrumentation and providing basic research was common in at Harvard and MIT in the later nineteenth century (Shimshoni, 1970; Etzkowitz, 1998). Later on the basic research took the shape of technology transfer from academics to industry and the academics played the major role either as producer of knowledge or the direct involvement in the new business venture (Etzkowitz, 1998).

Academic entrepreneurship generally refers to the involvement of academics into commercial activities in addition to teaching and research. This view leads to the understanding of involvement of academicians for the creation of new business ventures (Chrisman, Hynes & Fraser, 1995), consulting and patent-seeking (Klofsten & Jones-Evans, 2000). The much broader view on academic entrepreneurship is given by Lacetera (2009). This study views academic entrepreneurship as industry-university collaborations, university-based incubator firms, start-ups by academicians, double appointments of faculty in firms and universities. After conducting the meta-analysis of available literature Cantaragiu (2012) presents a comprehensive definition of academic entrepreneurship; “Academic entrepreneurship is a practice performed with the intention to transfer knowledge between the university and the external environment in order to produce economic and social value both for external actors and for members of the academia, and in which at least a member of academia maintains a primary role.” (p. 687)

Academic entrepreneurship is an additional feature of universities (Meyers & Pruthi, 2011) that includes more than imparting the education and training to the students. This originated in USA and then adopted by the universities in UK. It is quite a new phenomenon for the universities in developing world. According to Brennan, Wall and McGowan (2005) academic entrepreneurship is embedded into three overlapping fields of research like technology-based firms, commercialization of academic knowledge and entrepreneurial university. In their opinion this phenomena comprises of seven components. These are; i) Academic entrepreneur, ii) A discipline context, iii) A university context, iv) Technology based firms, v) University interventions to commercialize, vi) University interventions to create firms and, vii) Academics who engage with technology based firms (Brennan, Wall & McGowan, 2005). It is quite interesting to see that the academics occupy the two components among seven, which reflects the importance of academics in the field of academic entrepreneurship.

The research scholars view academic entrepreneurship as a process that starts within the university (Yusof, Siddiq, & Nor, 2012). In the similar study Wood (2011) presents the Process of academic Entrepreneurship

i. Innovation disclosure and intellectual property protection stage, ii. Awareness and securing industry partnerships stage, iii. Commercialization mechanism selection stage, and iv. Commercialization stage

The earlier research on academic entrepreneurship focuses on role of academic as a researcher or academic and then involving with the industry or any venture start-up (Samson & Gurdon, 1993). This is in accordance with the evolution of entrepreneurial university (Etzkovitz, 1998). These academics were recognized as the entrepreneurs. Chrisman et al. (1995) defined academic entrepreneurship in terms of phenomena within entrepreneurial universities that encompasses the creation of new business ventures and extended academic entrepreneurship to students including the academics. An important study conducted by Kirby (2006) mentions that it is entrepreneurial culture

within entrepreneurial universities that promote academic entrepreneurship and enables the academics and students to commercialize their intellectual properties.

In a similar study Dill (1995) mentioned that academic entrepreneurship included the formal efforts to commercialize the university research. This leads to understanding that the academic entrepreneurship is not incidental but it is intentionally undertaken by academics and universities to commercialize the research produced within universities. Aberu and Grinevich (2013) extend the entrepreneurial activities by academics into three categories i.e. formal commercial activities (Licensing and spin-offs), informal commercial activities (consultancy business and contract research) and non-commercial activities (informal advices and public lectures). They mention that the earlier studies mainly mentioned the formal activities in academic entrepreneurship because the formal activities are more visible and easy to quantify.

Philpott, Dooley, O'Reilly and Lupton (2011) developed the spectrum of entrepreneurial activities and categorized the entrepreneurial engagements of faculty into two categories namely hard and soft categories.

Wright (2014) mentions two roles of universities for the promotion of academic entrepreneurship, the first is the direct academic entrepreneurship means creating innovations, creating spin-offs by the academic scientist and the second roles is the indirect academic entrepreneurship which means the education and research may lead to entrepreneurial actions by alumni or students to create corporate spin-offs.

3. Methodology

To study the broad range of academic entrepreneurship, this study uses five categories of entrepreneurial activities. De Silva (2012) developed five categories of entrepreneurial activities by academics within universities.

Table 1. Categories of Entrepreneurial Engagements

Categories	Subcategories
Training and Consultancy	(a) Conduct seminars and training sessions for industry
	(b) Offer Research-based consultancy for industry through the university
	(c) Render Research-based consultancy privately (but without forming a company)
The Formation of Companies by University	(a) Contribute to the formation of university centers designed to carry out commercialization activities
	(b) Contribute to the formation of joint ventures in which the university and industry are the joint partners
	(c) Contribute to the formation of one or more new spin-off companies (university is the owner or equity holder of these companies)
	(d)Contribute to the establishment of university incubators and science parks
The formation of your own Company/ies in which University has no shares	(a) The formation of joint venture/(s) privately through collaboration with industry
	(b) The formation of your own company/(s)
Other Forms of Collaboration with Industry	(a) Collaboration with industry in joint research projects
	(b) Develop products or services which have potential for commercialization
	(c) Research-related assistance to small business owners
	(d) Attachment in the industry while still being employed with university
Academic entrepreneurial activities from basic research and teaching	(a) External teaching (excluding that for industry) for which you are paid in addition to the basic salary you are currently receiving
	(b) Develop and produce new degree programs
	(c) Acquire funding from government, non-government and international bodies (those without industry collaboration)

Source: De Silva (2012)

The first category denoted “Training and Consultancy” covers seminars, trainings and research-based consultancy by the academics. The second category is “The formation of companies by universities”, which covers the contribution of academics in any form to the formation of companies established by the university. This category centers on the academics’ role in commercialization activities carried out by university. These activities are

commercialization centers, university-industry joint ventures, formation of spin-offs, and establishment of incubators and science parks in university. The third category covers the formation of companies by the academics without university role in these companies. The fourth category denotes "Collaboration with industry" and centers on attachment of academics with industry, joint research with industry and developing potential products and services for commercialization. The fifth category covers basic teaching and research of academics like developing new degree programs, acquire funding for research and part time teaching with other educational institutes.

The survey was developed to explore the participation of academics towards the academic entrepreneurship (Entrepreneurial activities). The target respondents were the academics from six public sector universities of engineering and Technology in Pakistan. The self-administered questionnaire was used to collect the data. Total 306 academics participated in the survey conducted during December 2014 to February 2015.

A five-point Likert scale is used to capture frequency of the activities carried out by academics. The categories are; 1 = Not at all, 2 = To some extent, 3 = To moderate extent, 4 = To a great extent, and 5 = To a very great extent. The respondents were required to answer according to level of their participation in the activities.

4. Results and discussion

The data was collected from six universities of engineering and technology and 306 academics participated in the survey. Out of 306 academics, 246 (80.4%) are males and 60 (19.6%) are females with their academic qualifications ranging from PhD (23.2%), Masters (56.2%) and Bachelors (20.60%). The academic designations of the respondents range from Professors (5.6%), Associate Professors (5.9%), Assistant Professors (27.5%), Lectures (46.1%) and others (15%). In terms of prior industry experience before joining the academia, 41.5% respondents have no industry experience, 39.5% have up to 5 years, and 10.8% between 6-10 years and 8.2% have more than 11 years of industry experience before entering into academia. The sample is fairly distributed in terms of gender, age, academic designation, academic qualification and industry experience.

Table 2. Demographic Characteristics

Demographic	Frequency N=306	Valid Percent %
Gender		
Male	246	80.40
Female	60	19.60
Academic Qualification		
PhD	71	23.20
Masters	172	56.20
Bachelors	63	20.60
Academic Designation		
Professor	17	5.60
Associate Professor	18	5.90
Assistant Professor	84	27.50
Lecturer	141	46.10
Others	46	15.00
Industry Experience		
None	127	41.50
1-5 years	121	39.50
1-10 years	33	10.80
11 years and above	25	8.20

Table 3 presents the participation of academics in all five categories of entrepreneurial activities. The table is quite revealing about the participation of academics into entrepreneurial activities.

Table 3. Participation in Academic Entrepreneurship

Entrepreneurial Activities	1(%)	2(%)	3(%)	4(%)	5(%)	N(306)
(1) Conduct seminars and training sessions for industry	24.51	27.45	27.78	14.05	6.21	
(2) Offer Research-based consultancy for industry through the university	30.07	26.47	24.18	16.01	3.27	
3) Render Research-based consultancy privately (but without forming a company	33.99	27.78	20.92	15.36	1.96	
	29.52	27.23	24.29	15.14	3.81	100%
(4) Contribute to the formation of university centres designed to carry out commercialization activities	35.95	23.86	22.88	14.38	2.94	
(5) Contribute to the formation of joint ventures in which the university and industry are the joint partners	31.37	25.82	27.12	13.07	2.61	
(6) Contribute to the formation of one or more new spin-off companies (university is the owner or equity holder of these companies)	47.39	21.90	18.95	8.82	2.94	
(7)Contribute to the establishment of university incubators and science parks	42.48	21.57	20.59	12.09	3.27	
	39.30	23.29	22.39	12.10	2.94	100%
(8) The formation of joint venture/(s) privately through collaboration with industry	46.73	18.30	20.59	11.44	2.61	
(9) The formation of your own company/(s	45.75	19.28	19.61	12.42	2.94	
	46.24	18.79	20.10	11.93	2.76	100%
(10) Collaboration with industry in joint research projects	32.03	22.88	24.18	18.30	2.61	
(11) Develop products or services which have potential for commercialization	28.10	21.90	26.80	17.32	5.88	
(12) Research-related assistance to small business owners	32.68	25.16	24.51	13.07	4.58	
(13) Attachment in the industry while still being employed with university	38.89	19.93	21.57	15.69	3.92	
	32.93	22.45	24.23	16.10	4.25	100%
(14) External teaching (excluding that for industry) for which you are paid in addition to the basic salary you are currently receiving	37.25	18.95	27.12	12.75	3.92	
(15) Develop and produce new degree programmes	36.93	16.67	21.75	17.65	7.19	
(16) Acquire funding from government, non-government and international bodies (those without industry collaboration)	35.29	17.32	25.49	15.69	6.21	
	36.49	17.65	24.79	15.36	5.77	100%

For first category of training and consultancy, it was found that 70% of academics have participated in these activities with different rate of participation and 30% have not participated in these activities. For second category of formation of companies by university, results reveal that 60% academics have participated in such activities but the participation rate varies. Almost 46% have participated on low level for formation of companies, while 40% academics did not participate in formation of companies.

For third category of formation of companies by academics, 46% academics have not established any company or join venture with the industry, where as 54% agreed that they have established their own companies or have entered into joint venture with industry. Further data reveals that 40% academics have very minimal participation arte in establishment of companies.

For fourth category collaboration with industry, 63% academic agreed that they are collaborating with industry with different forms. The closer observation reveals that 47% have lower rate of participation. However, 37% academics have no collaboration with industry.

For the last category basic research and teaching, 37% academics revealed that they did not participate in external teaching and basic research activities for acquiring funding for research. Remaining 63% agreed that they have been involved in external teaching and acquiring funds for basic research from different bodies that promote research.

The results reveal that almost 60% of the sample has participated in different entrepreneurial activities from the external teaching to the formation of their own companies. This gives an observation that a healthy majority of academics in engineering universities of Pakistan are involved in entrepreneurial activities. It's quite evident from data that more academics are involved in external teaching and consultancy as compared to harder forms of commercialization like having joint projects with industry or establishment of their own firms in Pakistan. These findings are in accordance with Tijssen (2006) that academic entrepreneurship starts from less entrepreneurial activities then extends to more formal efforts like formation of spin-off companies by academics and universities.

The involvement of academics in the entrepreneurial activities is a sign that academic entrepreneurship takes place in Pakistani universities. The academics have accepted the additional roles of commercialization along with traditional role of teaching and research. The academic entrepreneurship within universities provides the mechanism to market the commercialization process. This is a step forward in creating the entrepreneurial universities in the country. This is an important role of university which needs to be recognized and embedded in policy making to gain the fruits of these organizations.

5. Implications and future research opportunities

Universities play a vital role in economic and social development. These institutions combine research with commercialization to meet the technological advancement of the country specially the developing countries, which export the technology into their country. The research which is relevant to the economic and social issues of the economy can save millions of dollars which can be utilized into other sectors of economy. This study proved the interest and engagement of academics into the research and commercialization activities into the economy. On the basis of findings this study recommends that the universities along with the government should describe the preferential areas of research for academics to pursue research with ultimate aim of commercialization. The universities and faculty need to overcome the concept of research for the sake of research or the research for publication only. The policy makers should focus on creation of spin-off companies to create more jobs and provide solution to unsolved problems. These spin-offs enhance the business opportunities for academics and other participants as well (Wright et al., 2007).University-Industry partnerships can be important avenue for commercialization of research produced within universities. This paper has studied the participation of academics only. To overcome this limitation, the study recommends that academic entrepreneurship should not be used as the final goal to be achieved by the policies but the value generated by these activities should be the ultimate goal for academics and universities. The future studies should focus on the value created by these entrepreneurial activities for the economic and social development. In order to meet the challenges of economic and social development, the academic entrepreneurship should be the strategy of universities and the policy makers at higher level (Hülsbeck & Lehmann, 2012).

6. Conclusion

Universities are required to play their role in socio-economic development of the country. To accomplish this objective, universities engage in technology transfer and academic entrepreneurship. There seems to be some evidence in Pakistan also, that academics are involved in the commercialization activities in universities. The activities range from external teaching to formation of companies. Paper presented the implications and future research opportunities.

References

Aberu, M., Grinevich, V., 2013. The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy, 42*(2), 408-422.

Audretsch, D. B., 2014. From the entrepreneurial university to the university for the entrepreneurial society. *The Journal of Technology Transfer, 39*(3), 313-321.

Brennan, M. C., Wall, A. P., McGowan, P., 2005. Academic entrepreneurship: Assessing preferences in nascent entrepreneurs. *Journal of Small Business and Enterprise Development, 12*(3), 307-322.

Cantaragiu, R., 2012. Towards a conceptual delimitation of academic entrepreneurship. *Management & Marketing, 7*(4), 683-700.

Chrisman, J. J., Hynes, T., Fraser, S., 1995. Faculty entrepreneurship and economic development: The case of the University of Calgary. *Journal of business venturing, 10*(4), 267-281.

De Silva, L., 2012. Academic entrepreneurship in a resource constrained environment. Available at https://www.escholar.manchester.ac.uk/uk-ac-man-scw:182475

Dill, D. D., 1995. University-industry entrepreneurship: the organization and management of American university technology transfer units. *Higher education, 29*(4), 369-384.

Etzkowitz, H., 1998. The norms of entrepreneurial science: Cognitive effects of the new university–industry linkages. *Research policy*, *27*(8), 823-833.

Etzkowitz, H., 2013. Anatomy of the entrepreneurial university. *Social Science Information*, *52*(3), 486-511.

Hülsbeck, M., Lehmann, E. E. 2012. Academic entrepreneurship and board formation in science-based firms. *Economics of Innovation and New Technology*, *21*(5-6), 547-565.

Kirby, D. A., 2006. Creating entrepreneurial universities in the UK: Applying entrepreneurship theory to practice. *The Journal of Technology Transfer*, *31*(5), 599-603.

Klofsten, M., Jones-Evans, D., 2000. Comparing academic entrepreneurship in Europe–the case of Sweden and Ireland. *Small Business Economics*, *14*(4), 299-309.

Lacetera, N., 2009. Academic entrepreneurship. *Managerial and Decision Economics*, *30*(7), 443-464.

Markuerkiaga, L., Errasti, N., Igartua, J. I., 2014. Success factors for managing an entrepreneurial university: Developing an integrative framework. *Industry and Higher Education*, *28*(4), 233-244.

Meyers, A. D., & Pruthi, S., 2011. Academic entrepreneurship, entrepreneurial universities and biotechnology. *Journal of Commercial Biotechnology*, *17*(4), 349-357.

Philpott, K., Dooley, L., O'Reilly, C., Lupton, G., 2011. The entrepreneurial university: Examining the underlying academic tensions. *Technovation*, *31*(4), 161-170.

Ray, J., 2013. Academic Entrepreneurship. In *Encyclopaedia of Creativity, Invention, Innovation and Entrepreneurship* (pp. 9-16). Springer New York.

Samsom, K. J., Gurdon, M. A., 1993. University scientists as entrepreneurs: A special case of technology transfer and high-tech venturing. *Technovation*, *13*(2), 63-71.

Shimshoni, D., 1970. The mobile scientist in the American instrument industry. *Minerva*, *8*(1), 59-89.

Tijssen, R. J., 2006. Universities and industrially relevant science: Towards measurement models and indicators of entrepreneurial orientation. *Research Policy*, *35*(10), 1569-1585.

Wood, M. S., 2011. A process model of academic entrepreneurship. *Business Horizons*, *54*(2), 153-161.

Wright, M., 2014. Academic entrepreneurship, technology transfer and society: where next?. *The Journal of Technology Transfer*, *39*(3), 322-334.

Wright, M., Hmieleski, K. M., Siegel, D. S., Ensley, M. D., 2007. The role of human capital in technological entrepreneurship. *Entrepreneurship Theory and Practice*, *31*(6), 791-806.

Yusof, M., Siddiq, M. S., Nor, L. M., 2012. Internal factors of academic entrepreneurship: The case of four Malaysian Public Research Universities. *Journal of Entrepreneurship, Management and Innovation*, *8*(1), 84-115.